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according to *Nature*, details the results of investigations on the presence of chlorophyll in the epidermis of leaves. Hitherto it has generally been supposed that submerged phaenogamous plants, with a few exceptions, contain chlorophyll in their epidermis, while terrestrial phaenogams, also with a few exceptions, have an epidermis destitute of chlorophyll. Herr Stohr's experiments, however, point to a different conclusion. He finds that while chlorophyll is contained in the epidermis of most of the broad-leaved gymnosperms and of by far the greater number of terrestrial phaenogams, it is absent from that of the needle-leaved gymnosperms and the terrestrial monocotyledons. In most cases the chlorophyll does not occur in the epidermis of the upper surface of the leaf, being quickly destroyed on its formation by a too intense light; but is only to be found in that of the under surface and also of the leaf petioles and stipules. So far as the evolution of the chlorophyll bodies was observed the latter showed themselves as starch-chlorophyll bodies. These experiments were made upon the leaves of nearly one hundred species.

Changes in the Diameter of the Trunks of Trees.—According to the *Gardeners' Chronicle*, MM. Kraus and Kaiser have been making some researches from which it appears that the trunks of trees undergo daily changes in diameter. From early morning to early afternoon there is a regular diminution till the minimum is reached, when the process is reversed and the maximum diameter attained at the time of twilight; then again comes a diminution, to be succeeded by an increase about dawn—an increase more marked than that in the evening. The variations in diameter coincide, therefore, with those of the tension, but they are shown to be inverse to the temperature, the maximum of the one corresponding roughly to the minimum of the other, and so on.

Preparation of Toadstools for the Herbarium.—In a recently-received check-list of plants sent us by the *Schlesischen Botanischen Tausch-Vereins*, we find a method, as practised by Herr E. Jacobasch, of Berlin, of preparing fleshy species of fungi for the herbarium, and which, briefly stated, is as follows: The perfectly fresh toadstool is divided vertically through the centre and the two halves are laid down on stout paper with liquid glue and then submitted to a gentle pressure. The glue immediately penetrates the substance of the fungus and expels all the water contained therein, and so quickly too that in a few minutes the whole surface of the pileus will be seen covered with bead-like drops of moisture. The glue, moreover, drives out or destroys all the insect larvae that may be present. The preparation after one or two days will be found thoroughly dry, and its color, with the exception of being a little darker, will be perfectly preserved. The spores having been collected on paper in the usual manner, are affixed thereto by immersion in milk. Further notes on this same subject will be found on another page.

§ 18. **Botanical Literature.**—Trimen's *Journal of Botany* for January contains articles on '*Chara obtusa*, a species new to Britain,' by H. and J. Groves; 'History of the Scorpoid Cyme,' by Sidney H. Vines; '*Potamogeton lanceolatus* of Smith,' by C. C. Babbington; 'Musci

Praeteriti,' by Richard Spruce; and 'Plants of Aran Island, Co. Donegal,' by H. C. Hart.

Botanische Zeitung (No. 52) Dec. 25th. 'Researches on the Origin of Starch-granules,' (with a plate), by A. W. F. Schimper.

Annales des Sciences Naturelles, Tome X, Nos. 2 and 3. 'On the Influence of the Intensity of Light on the decomposition of Carbonic Acid by Plants,' by A. Farmintzin; 'Researches on the rôle of Light in Germination,' by A. Pauchon.

American Naturalist for January. 'On the Fertilization of *Calamintha Nepeta*,' by William Trelease; 'Botanizing on the Colorado Desert,' by Edward Lee Greene; 'Method of distinguishing species of *Populus* and *Juglans* by the young naked branches,' by W. J. Beal.

Journal of the Microscopical Society, Dec., 1880. Williams & Norgate, London and Edinburgh. In this bi-monthly of nearly two hundred pages, there is a vast amount of interesting matter, original and selected. We quote an item of the latter: "Contrary to the views of Reess and Darwin, E. Regel finds that the plants (*Droserae*) thrive best when not treated with animal food." This may be the tendency of Mr. Higley's experiments recorded in recent numbers of the *Botanical Gazette*; yet, with the evidence of our bogs, where one seldom finds a well-developed *Drosera* without the débris of insects on its leaves, it is hard to admit that the plants are not benefitted by their prey.

Geological Survey of California, Botany, Vol. II.—The first volume of this work was issued in 1876, the Polypetalae by W. H. Brewer and Sereno Watson; the Gamopetalae by Asa Gray. The Legislature of California having withdrawn its aid, we are indebted (as Prof. Whitney states in a prefatory note) to S. C. Hastings and other gentlemen of San Francisco for the publication of these two noble volumes. The Flora of the second volume—Apetalous Dicotyledons to the end of *Musci* and *Sphagnaceae*—is edited by Sereno Watson. Dr. George Engelmann has elaborated the Oaks, the Pines and their allies and the *Loranthaceae*; M. S. Bebb, Esq., has done the same for the Willows; Wm. Boott, Esq., has supplied the portion upon the *Carices*; Dr. George Thurber the Grasses, and Prof. Daniel C. Eaton the Ferns and other higher cryptogams. If the publication has necessarily been delayed on this account, the superior character of the work is an ample compensation. The extent of the additions that have been made to our knowledge of the flora of the State during the past four years may be seen by reference to the many papers devoted to them—62 pages of additions and corrections. There still remains ample opportunity for good botanical work at almost every locality among the mountains, hills and valleys of the State.

The second volume is provided with analytical tables and a complete index to the ten volumes, and with two appendices, numbered I. and IV. Appendix I. is a glossary of botanical terms employed, and IV. is a list of persons who have made botanical collections in California, by W. H. Brewer. To this is added a supplement, by Mr. Watson, of especial acknowledgment to those whose contributions have aided essentially in the preparation of the work, and among these

are several ladies whose names must be familiar to our readers. The hiatus in the numbering of the appendices is owing, we suppose, to the omission of the accented list of generic names, with their derivations contemplated in the first volume, and to the omission of the mere lists of some of the lower cryptogams, which was all that their incomplete collection and study would authorize. After the mention made of the master hands engaged upon this work, we have no need to commend it further to our readers. The volumes, one or both, can be obtained from Sereno Watson, Botanical Garden, Cambridge, Mass. The price per volume to botanists is \$5.00. Advise whether to be sent by mail (postage 40 cents a volume) or by express.

The Flora of Essex Co., Mass., By John Robinson, Essex Institute, Salem, Mass. After the preface comes the literature of the subject, and then an introduction giving a general account of the character of the flora. The land plants of the county belong decidedly to the northern flora, although not so arctic in their character as the lichens and algae. "There is an almost total absence of many species common from Cape Cod southward and often found just south of Boston. In contrast to this the *Magnolia glauca* is still quite abundant at Gloucester, but not found again north of New Jersey. At Cape Ann is the southern limit of the little *Sagina nodosa*, and there is also found *Potentilla tridentata*, familiar at the Isle of Shoals and on Mt. Washington. Essex County seems also to be the southern limit, for this region, of *Pinus resinosa* (red pine), *Abies nigra* (black spruce), *Vaccinium Vitis-Idaea*, *Viola rotundifolia*, etc., as it is the northern limit of *Cupressus thyoides* (white cedar), *Quercus prinoides* (chinquapin oak), *Polygonum Carey*, *Draba Caroliniana*, *Lygodium palmatum* (climbing fern), and others. At Boxford is what has proved thus far to be the only New England station for *Salix candida*; and another bog willow, *Salix myrtilloides*, is occasionally met with. At Andover a locality for *Calamagrostis Pickeringii* was discovered in the summer of 1879; this species has only been known before at the White Mountains." After the Introduction we have a sketch of some of the early botanists, and then the Flora, which takes in the Algae, but omits the Fungi. Prof. Robinson has had the aid, in various of the more difficult orders, of specialists to whom he makes his acknowledgments, particularly of Mr. Chas. J. Sprague in the Lichens, and of Mr. Austin in the Musci and Hepaticae. There is a good index at the end. Those who know Prof. Robinson's love of good work will not be disappointed in this catalogue, though some of the determinations, in so wide a range of orders, many of them yet imperfectly studied, may admit of difference of opinion.

Correspondance Botanique.—Prof. Ed. Morren of Liège, Belgium, sends us his annual list of Botanic Gardens, Chairs, Nurseries, Reviews and Societies. The United States seem to be quite well reported. Price 3 francs.

Botanical Exchanges.—We have frequently been asked the address of European botanists who would exchange European for American plants. We have before us the Nineteenth Annual Exchange-List of the *Schlesischen Botanischen-Vereins*. Address Adolph Toeffer, Brandenburg a | H, Prussia.